

ABSTRACT

Work piece processing is performed by pulsed discharges between an anode (2) and a magnetron sputtering cathode (1) in solid-gas plasmas using a chamber (2) containing the work piece (7). A system (12) maintains a vacuum in the chamber and another system (14) provides sputtering and reactive gases. The pulses are produced in a plasma pulser circuit including the anode and the cathode, the discharges creating gas and partially ionized solid plasma blobs (3) moving or spreading from a region at a surface of the cathode towards the work piece and the anode. A potential is applied to the work piece so that a pulsed current comprising biasing pulses arises between the second electrodes. In particular biasing discharges are produced between the anode and the work piece when said plasma blobs have spread to regions at the anode and at the work piece so that the pulsed current is the current of these biasing discharges. The method is efficient for processing or modifying surface regions of work pieces of various kinds and configurations and can be employed for achieving efficient work piece etching, interface mixing, surface and bulk diffusion, gas absorption and desorption, initial and further stages of thin film condensation, and for performing ion plating.